Exhibit 24

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,
V.
SINGULAR COMPUTING LLC,
Patent Owner

Case No. IPR2021-00155/Patent No. 10,416,961
Case No. IPR2021-00165/Patent No. 9,218,156
Case No. IPR2021-00179/Patent No. 8,407,273

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REMOTE VIDEOTAPED / REALTIMED DEPOSITION OF
SUNIL P. KHATRI, Ph.D.
OCTOBER 21, 2021

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Job No. CS4838992

need to refer to it. I think we're having a little trouble picking up your audio, if you're not sort of pointing your face at the microphone.

A. Oh, you know what? Is it better now? I had the flap of the binder was on the microphone, maybe.

Q. Oh, okay.

A. Better now?

Q. Yes.

So I would like to look in your declaration on Page 19 at Paragraph 55.

A. Yeah.

Q. Could you actually just read Paragraph 55 of your declaration to yourself and let me know when you're finished.

A. Okay.

(Reviewing.)

Yes, I'm done.

Q. All right. So in Paragraph 55 of your declaration on the '961 patent, you discuss a digit-serial multiplication circuit that Tong teaches. Correct?

MR. COWELL: Objection to form.

A. Yes. Did you hear me? I guess

there is nothing changed since the morning. The audio and everything is exactly the same as before. I'm -- let me move the computer a little bit and see if that helps.

Q. (By Ms. Hunt) I think it's better when your face is facing the camera than when -- than when your face turns the other way.

A. Okay. Let me see if I can move like this. I will move the binder like right here so it's in the line of my camera (indicating). Okay.

Q. So I don't think the court reporter caught your answer.

But the question was just: In Paragraph 55 of your declaration, you discuss a digit-serial multiplication circuit that Tong teaches. Correct?

MR. COWELL: Objection to form.

A. In Paragraph 55, I talk about, you know, Tong teaching this digit-serial multiplication circuit in the paper.

Q. And is Tong's digit-serial multiplication circuit an LPHDR execution unit?

MR. COWELL: Objection to form.

A. So, you know, Tong's digit-serial multiplication unit actually performs multiplication at various precisions.

You know, it can perform 24 bit multiplication and it can perform multiplication at different bit widths.

So it's one single circuit that can perform multiple -- multiple bit widths of multiplication, and therefore it is not an LPHDR unit.

Q. (By Ms. Hunt) Did you say that because Tong's digit-serial multiplication circuit can perform multiplication at various precisions, it's not an LPHDR unit?

A. Yes.

MR. COWELL: Objection to form.

A. I mean, to answer that question, I would look at my definition of LPHDR units.

And, you know, we've talked about my -- the definition, which is basically what a person of ordinary skill in the art would understand the LPHDR unit to

mean.

And if we applied that test, you know, Tong would fail that test.

Q. (By Ms. Hunt) And you're saying Tong would fail that test because there is more than one precision at which Tong's digit-serial multiplication circuit can operate?

MR. COWELL: Objection to form.

A. Tong fails the test for multiple reasons. We can apply that test, you know, based on my -- on a construction of person of ordinary skill in the art would have for an LPHDR unit.

Q. (By Ms. Hunt) So what are the multiple reasons that it fails?

A. So let me go back to the -- to the test of the LPHDR, that construction for the LPHDR unit.

I'm trying to find that location. Can you help me find the paragraph?

Q. I think it's Paragraph 59.

A. So in Paragraph 59, you know, the LPHDR, the low precision high dynamic

range, execution unit would be defined as an execution unit that executes arithmetic operations only at low precision and with high dynamic range, wherein low precision and high dynamic range are defined according to the numerical requirements below.

Now, the Tong digit-serial multiplication unit, if I go back to the reference of Tong -- I think it's on Page 280. Let me see.

So it performs -- you know, first of all, it performs -- it can perform -- let's see. Let me find the right -- there we go.

If you look at Page 280 towards the bottom of the left-side column, it says that the 24-by-8 bit architecture allows us to perform 8, 16, and 24 bit multiplication bypassing the data once, twice, or thrice through the multiplier.

So essentially it's basically -- you know, it's just like variable precision multiplier that is taught by Tong in that it can perform three different precisions of multiplication.

Q. Are any of those precisions a precision multiplication?

MR. COWELL: Objection to form.

A. So, you know, these precisions aren't -- they are 24 bit, and therefore basically that's -- you know, that's much more than the 8 bit precision or 16 bit, but it can go all the way up to 24 bits of precision.

Q. (By Ms. Hunt) But to do that, it has to use multiple clock cycles to do the higher precision. Right?

MR. COWELL: Objection to form.

Outside the scope.

A. It uses extra clock cycle and extra control logic as Tong teaches in order to do that.

So in other words, it's not a -- you know, it doesn't do one precision but it does multiple of these precisions using control logic that chooses between one of these three selections.

Q. So is it the fact that it's doing more than one precision that makes you say that it's not LPHDR?

MR. COWELL: Objection to form.

A. Can you repeat the question?

Q. (By Ms. Hunt) I'm trying to understand, is it -- are you saying it's not LPHDR because it does more than one precision or is it something about the level of precisions that it can do?

A. No, so if you --

MR. COWELL: Objection to form, outside the scope.

A. If you look at the construction of LPHDR, it is an execution that -- sorry -- it is an execution unit that executes arithmetic operations only at low precision and at high dynamic range.

So it needs to compute, you know -- I mean, it needs to compute arithmetic operations only at low precision.

Q. (By Ms. Hunt) And so which of the operations in Tong's digit-serial multiplication circuit are not at low precision?

MR. COWELL: Objection to form. Outside the scope.

A. So, for example, the 24 bit

precision is -- you know, if it uses the mantissa as exponents of -- you know, according to the standard IEEE ratio, it would be, for example, some -- it would be an arithmetic unit that, you know, doesn't execute arithmetic operations only at low precision.

24 bit is generally, you know, a very high precision compared to the precisions that we're talking about, you know, for the Singular patents.

Q. (By Ms. Hunt) But to the extent Tong's digit-serial multiplication circuit can do a 24 bit multiplication, it's just doing a combination of multiple lower precision multiplications. Right?

MR. COWELL: Objection to form. Outside the scope.

A. I don't know what that means. It's basically doing 24 bit multiplication. I don't know what combination of lower precisions means.

Q. (By Ms. Hunt) You said in Paragraph 55 of your declaration starting four lines up from the bottom of the

page -- sorry -- starting at the fifth line up from bottom of the page: "The result of this reduced-precision operation, in which an 8-bit operand is multiplied with a 24-bit operand, can be combined with other reduced-precision results over multiple clock cycles in process called "digit-serial multiplication," yielding a full-precision result."

Correct?

A. Can you point me to where that is? Sorry. You lost me.

Q. In your declaration, Paragraph 55 --

A. Yes.

Q. -- this is the second sentence of Paragraph 55 of your declaration.

A. Okay.

Q. "The results of this reduced-precision operation, in which an 8-bit operand is multiplied with a 24-bit operand, can be combined with other reduced-precision results over multiple clock cycle this a process called "digit-serial multiplication," yielding a full-precision

result."

A. Yes. I see that.

Q. So isn't that actually doing multiple reduced-precision multiplications?

A. No, I wouldn't say that.

MR. COWELL: Objection to form.

A. It's like three different, separate, you know -- it's three different, separate precisions, one of them being a full precision.

And that's why -- you know, it's not -- as a consequence, it's not an execution unit that executes arithmetic operations only at low precision with a high dynamic range.

MR. COWELL: Form. Go ahead.

Q. (By Ms. Hunt) You think that's true because it can do a full-precision multiplication even though that takes multiple clock cycles to do?

MR. COWELL: Objection to form.

Outside the scope.

A. That's just the technique it use, but at the end of the day, it's able to do -- you know, it's able to do full

precision as well.

So it's able to do three different precisions, as the language on Paragraph 286 -- sorry -- on Page 280 says.

It says (as read): "A 24-by-8 bit architecture, see Figure 9, allows us to perform 8, 16, and 24 bit multiplication."

So it's -- and the way it allows -- the way it does that is by special control logic. So it's a circuit that actually does three different things.

Q. (By Ms. Hunt) The one that results in a full-precision result, as you say, makes it not an LPHDR unit?

MR. COWELL: Objection to form. Asked and answered. Outside the scope.

A. The language of my -- you know, the language in -- in my declaration is clear.

It says an execution -- you know, an LPHDR unit is an execution that executes arithmetic operations only at low precision.

So if an execution unit

operates -- I mean, executes arithmetic operations only at low precision and high dynamic range, then it would be considered an LPHDR unit.

It needs to only be low precision and high dynamic range for arithmetic operations.

Q. (By Ms. Hunt) Can you look forward to Page 20 of your declaration on the '961 patent, please.

A. Okay.

Q. And on Page 20 you have a section on "MacMillan."

Do you see that?

A. Yes.

Q. All right. And, again, just in case you need to refer to it, you should have a copy of MacMillan in your binder. It was previously marked Exhibit 1009.

(Previously marked was Exhibit No. 1009.)

A. I have that in front of me.

Q. (By Ms. Hunt) So I would like to still look in your declaration on Page 21. I'm looking at Paragraph 58.